

ART. IX.—*New or Little-known Victorian Fossils in the  
National Museum.*

PART XVI.—SOME SILURIAN BRACHIOPODA.

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(With Plates X. and XI).

[Read 12th June, 1913].

Introduction.

The fauna of the Victorian Silurian strata includes a rich assemblage of brachiopods; and although the number in this group, together with the present contribution, now amounts to about 60 species, yet probably not more than half has been described.

A selection of the better preserved specimens has been studied, and the results, given herewith, help to show how interesting is the Australian Silurian fauna compared with that of other widely separated areas. One feature of the present series is the marked Devonian element found in the otherwise Wenlockian or newer Silurian facies of our Yeringian mudstones.

Amongst the more noticeable points brought out by the present work is the presence of a denticulate hinge in *Leptaena rhomboidalis*, especially in shells of the younger or neanic stage, a structure hitherto unknown in this genus. The wonderfully well-preserved impression of the brachial arms in the same species of *Leptaena* is also figured and described here for the first time from Australian rocks; and the brachial supports of one of the specimens tends to show affinity with the chonetine structures in similar valves of the Productidae.

For some of the fossiliferous material included in the present paper the writer is indebted to Mr. W. S. Dun, F.G.S., of Sydney, who, some years ago undertook to describe Mr. G. Sweet's collection of Silurian fossils, but who, after my arrival in Australia, generously and insistently passed on the collection to be worked out in the National Museum by myself. Consequently upon this, Mr. Sweet has consented to donate the described specimens as they are dealt with from time to time.

List of genera and species herein described:—

- Siphonotreta plicatella*, sp. nov.  
*Crania pulchelloides*, sp. nov.  
*Leptaena rhomboidalis*, Wilckens sp.  
*Leptaena rhomboidalis*, var. *undata*, McCoy.  
*Chonetes bipartita*, sp. nov.  
*Conchidium knightii*, J. de C. Sowerby  
*Clorinda linguifera*, Sow. sp. var. *wilkinsoni*, Etheridge fil.  
*Gypidula victoriae*, sp. nov.  
*Atrypa reticularis*, Linué sp., var. *decurrens*, var. nov.  
*Atrypa aspera*, Schlotheim sp.  
*Atrypa fimbriata*, sp. nov.  
*Cyrtina sub-biplicata*, sp. nov.  
*Spirifer lilydalensis*, sp. nov.

## SYSTEMATIC DESCRIPTION OF THE FOSSILS.

### Class BRACHIOPODA.

#### Fam. SIPHONOTRETIDAE.

#### Genus *Siphonotreta*, de Verneuil.

*Siphonotreta plicatella*, sp. nov. Plate X., figs. 1a-c.

*Description*.—Pedicle valve subrectangular, transverse; posterior margin broadly convex, cardinal angles rounded; anterior margin nearly straight, with a median sinus. Pedicle opening close to posterior margin, apical, and communicating with a short, open channel directed anteriorly; a median wrinkle denotes the position of the underlying pedicle tube. Shell folded into three areas, two postero-lateral depressed-convex areas, and an anterior median and sunken area. Surface ornament consisting of concentric laminar folds and vertical striae; the latter probably representing remnants of short, spinous processes; also a few corroded and broken tubular cavities with jagged edges pointing to the former presence of several long spines.

*Measurements*.—Holotype. Length, 3.5 mm.; width, 5 mm.; height, approximately, 1 mm.

*Observations*.—The present species is definitely placed in the above genus, *Siphonotreta*, on account of the apical foramen and spinous character of the shell. The transverse character of the outline is somewhat peculiar for *Siphonotreta*, but this may be almost matched in some varieties of *S. australis*, Chapman,<sup>1</sup> from the

<sup>1</sup> Proc. Roy. Soc. Victoria, vol. xvi. (n.s.), pt. i., 1903, pp. 65, 66, pl. x., figs. 7, 8, 13; pl. xi., fig. 1.

Silurian (Melbournian) of South Yarra, Victoria. In outline *S. plicatella* very nearly resembles Barrande's "*Discina*" *plicosa*<sup>1</sup> from stages F and G (Lower Devonian) of Branik and Konieprus in Bohemia. That form, however, is a true *Orbiculoides*, having a posterior foramen, as well as merely finely concentric ornament.

*Occurrence*.—Silurian (Yeringian). In grey mudstone: Yan Yean, Victoria. Presented by A. J. Shearsby, Esq., F.R.M.S.

Fam. CRANIIDÆ.

Genus *Crania*, Retzius.

*Crania pulchelloides*, sp. nov. Plate X., figs. 2a, b.

*Description*.—Shell small, subpentagonal, slightly wider than long (length measured post-anteriorly). Free valve depressed limpet-shaped; the apex situated a little towards the posterior margin. Posterior margin short, straight, rather sharply angulated at the extremities; thence the margin slopes steeply towards the rounded and broad anterior margin. Surface of free valve furrowed with concentric growth-lines and depressions, and having a variable series of moderately-fine radial riblets converging to the apex. Between the primary sharp and salient riblets there is a second system of fine striae, commencing some distance from the vertex, and extending to the margin of the valve.

*Measurements*.—Length, 4.5 mm.; width, 5.25 mm.; approximate height, 2.5 mm.

*Observations*.—Undoubtedly the nearest allied form to the above is *Crania pulchella*, Hall and Clarke,<sup>2</sup> a species occurring in the Lower Heidelberg, near Clarksville, New York State. The shell is larger and more rotund in outline than *C. pulchelloides*. None of the British species appear to approach the Australian form here described.

*Occurrences*.—Found occasionally in the Silurian (Yeringian) mudstone in the neighbourhood of Lilydale. Holotype (from Rud-dock's Quarry) presented by W. J. Parr, Esq.

Fam. STROPHOMENIDÆ.

Genus *Leptaena*, Dalman.

*Leptaena rhomboidalis*, Wilckens sp. Plate X., figs. 3-7.

*Conchites rhomboidalis*, Wilckens, 1769, Nachricht von seltenen Versteinerungen, vorzüglich des Thierreichs, p. 79, pl. viii., figs.

1 Syst. Sil. Bohême, vol. v., 1879, pl. ci., figs. ii., 1-7.

2 Pal. N. York, vol. viii., Pal. Brach., pt. i., 1892, p. 180, pl. ivII., fig. 3.

43, 44. *Leptaena depressa*, Sowerby, 1839, in Murchison's Silurian System, pp. 623, 636, pl. xii., fig. 2. *Strophomena rhomboidalis*, Wilckens sp., Davidson, 1871, Mon. Sil. Brach (Pal. Soc.), pt. vii., pt. vii., No. 4, p. 281, pl. xxxix., figs. 1-21; pl. xlv., fig. 1. *Leptaena (Leptagonia) rhomboidalis*, Wilckens sp., McCoy, 1877, Prod. Pal. Vict., Dec. V., p. 19, pl. xlvi., fig. 1:

*Observations.*—As McCoy has remarked, the Victorian specimens of *L. rhomboidalis* show no difference from the European examples, and exhibit the same variable characters. The species is a very abundant fossil in certain of the mudstone facies of the newer or Yeringian division of the Victorian Silurian, some fossiliferous blocks being quite crowded with their remains to the exclusion of other shells. Three very interesting examples of this species having an important bearing on the phylogenetic relationship of this group, were discovered in the mudstone at Loyola, near Mansfield, by Mr. Geo. Sweet, F.G.S., and these are described below.

*Note on a specimen of Leptaena rhomboidalis showing striate denticulations on the cardinal area.* (Plate X., fig. 3.)

Hitherto the hinge-line of *Leptaena depressa* has been held to have a non-denticulate character. Amongst the well-preserved casts of this shell in the Sweet collection, however, there is one specimen in the neanic stage,<sup>1</sup> 13.75 mm. wide, showing the cardinal line, especially on the portions nearest to the cardinal process of the opposed brachial valve, to have fine but well-marked linear ridges normal to the hinge margin.

In Hall and Clarke's summary of characters in the genus *Leptaena*<sup>2</sup> those authors say "Cardinal area narrow, slightly wider on the pedicle valve, not denticulate." It is conceivable that these denticulae now recorded may be only partially calcified as a rule, and thus similar to other structures only occasionally seen in this genus, such as the spiral brachia, and the striated muscular areas, and that the process of fossilisation more often tends to their disappearance than to their preservation. Another reason to be assigned for this denticulate structure hitherto escaping observation is that the usual condition of the matrix is more or less calcareous, and this tends towards a secondary mineralisation of the fossil body; whereas the mudstone of the Victorian Silurian lends itself admirably to the preservation of delicate organic structures such as this. In fact, the fine, oozy mud which was laid down in those times was to

1 That is, a young form developing the adult characters of the shell.

2 Pal. N. York, vol. viii., Pal. Brachiopoda, pt. i., 1892, p. 277.

all intents and purposes comparable to a colloid substance, and took an instantaneous impression of the intricate structural features of the organism before they became deteriorated by agents of decay.

*Note on a brachial valve of Leptaena rhomboidalis showing well-preserved impressions of the brachial spiralia.*

(Plate X., figs. 4, 5.)

This shell is in the early neanic stage, and measures only 5 mm. in length by 7.5 mm. in width. It represents the interior of a brachial valve with the fleshy spiralia strongly impressed on the surface. The positive form of the spiralia is seen in the wax impression. It shows them to have been apparently diplospiral,<sup>1</sup> but of few convolutions, the apices directed to the front (ventrally) and slightly outwards. That this specimen is the interior of a brachial valve and not merely the impression in mudstone is evident from the fact that true shell structure is present by the distinct perforations all over the internal surface. The cardinal area is very distinctly crenulate, more strongly so than in the neanic form herewith figured to illustrate this new character in *Leptaena* (Fig. 3). These points tend to support the suggestion here brought forward that the denticulate hinge character disappears with age and shell-development, owing perhaps to the greater strength acquired in later stages by the formation of the dental lamellae adjacent.

The form of the spiralia, so clearly demonstrated by a wax impression, is even more definite than in the beautiful example of the Gothland specimen figured by Davidson.<sup>2</sup> Moreover, in our example the spires are seen to be attached directly to the crura at the posterior end of the septum.

*Note on a brachial valve of Leptaena rhomboidalis showing brachial markings or supports.* (Plate X., figs. 6, 7.)

This specimen, discovered by Mr. Sweet, is also, as in the former example, in the neanic stage. It is a very faithful mud-cast of the interior of the brachial valve. The crenulation of the cardinal area is very distinct. The septum is well developed, extending nearly the whole length of the shell. The bases of the brachial supports follow the general trend of the spiralia, but show a curious angularity of outline towards the anterior margin; a character

<sup>1</sup> A double spire formed by the continuity of the bifurcated jugum with the convolutions of the spire. In this particular case the continuation of the jugal processes was probably of a chitinous nature.

<sup>2</sup> Op. cit., pl. xxxix., fig. 16.

seen in *Chonetes* and *Strophalosia*, to which this genus, at least in its young stages, shows marked affinities. It is more than probable from the above structural features that *Leptaena* is of a more advanced type of the Strophomenidae, which shows retrogressive tendencies in its later development.

*Occurrence*.—The above species, *L. rhomboidalis*, has been recorded from one doubtful Melbournian locality, Fraser's Creek, Springfield; otherwise, it is restricted in Victoria to the Yeringian stage, occurring at Lilydale, Croydon, Loyola and the Thomson River. It also occurs in the passage beds (between Melbournian and Yeringian) at Whittlesea.

The unique specimens showing the spiralia and brachial supports, as well as the example with finely denticulate hinge-line, were found by Mr. Geo. Sweet, F.G.S. at Loyola, near Mansfield, who has presented them to the Museum.

***Leptaena rhomboidalis*, Wilckens sp.; var. *undata*, McCoy.**

*Orthis undata*, McCoy, 1846, Syn. Sil. Foss., Ireland, p. 136, pl. iii., fig. 1. *Leptaena deltoidea* Conrad, var. *undata*, McCoy, 1852, Brit. Pal. Foss., p. 234, pl. 1H., figs. 38, 39. *Strophomena deltoidea*, Conrad sp., var. *undata*, McCoy, Davidson, 1871, Mon. Sil. Brach. (Pal. Soc.), pt. vii., No. 4, p. 295, pl. xxxix., figs. 23, 24. *L. rhomboidalis*, Wilckens sp. var. *undata*, McCoy, Chapman, 1907, Vict. Nat., vol. xxii., p. 239.

The characteristic ripple-surfaced shell of the above form is met with in various stages of development, from 35 to nearly 100 mm. in width, in the Victorian Silurian. It appears to keep tolerably distinct from *L. rhomboidalis* by its more transverse shape, larger size and irregular and persistently wrinkled surface; and it may therefore be regarded as a tolerably well-marked variety of *L. rhomboidalis*.

*Occurrence*.—Silurian (Yeringian). Loyola, near Mansfield, in hard, brown and grey mudstone. Collected by Geo. Sweet, Esq., F.G.S.

FAM. PRODUCTIDÆ.

Genus *Chonetes*, Fischer.

*Chonetes bipartita*, sp. nov. Plate X., figs. 8-10.

*Description*.—Shell small, semicircular or transverse. Pedicle valve strongly convex; median area conspicuously arched and medially sulcate; beak prominent; area on either side of median

ridge depressed and concave towards the cardinal extremity. Hinge line straight, extremities acute and more or less extended; anterior margin regularly and broadly rounded. Brachial valve concave, with two divergent folds or flexures of the shell-surface. Surface of both valves punctate, bearing about 30 thin radial riblets with fine intermediate striae near the anterior border.

*Measurements.*—Pedicel valve (Cotype): Length, 3.5 mm.; width, 5.25 mm. Another example (Paratype): Length, 4.5 mm.; width, 8 mm. Brachial valve (Cotype): Length, 3.25 mm.; width, 5.5 mm.

*Observations.*—This neat little species belongs to the section of the genus styled Plicosae, having not more than 30 riblets. It agrees to some extent with the Wenlock species, *Chonetes minima*, Sowerby sp.<sup>1</sup> but differs to a marked extent in the median division of the umbonal ridge, and by having a generally wider or more transverse shell. The "*Leptaena*" *minima* referred to by Prof. McCoy on quarter sheet No. 4 S.W. locality Bb 20, Kilmore Creek, probably related to this or an allied species.

*Occurrence.*—Silurian (Yeringian). Common in the mudstone of Ruddock's Quarry, near Lilydale; and at the Geol. Surv. locality Bb 16, at Simmonds' Bridge Hut on the Yarra.

#### FAM. PENTAMERIDAE.

##### Genus *Conchidium*, Linné.

*Conchidium knightii*, J. de C. Sowerby, sp. Plate XI., fig. 11.

*Pentamerus knightii*, Sowerby, 1813, Min. Conch., vol. i., p. 73. pl. xxviii. Idem, 1839, in Murchison's Silurian System, p. 615. pl. vi., figs. 8a-c. Davidson, 1867, Mon. Sil. Brach. (Pal. Soc.), vol. xx., p. 142, pl. xvi., figs. 1-3; pl. xvii., figs. 1-10; pl. xix., fig. 3. Etheridge, R., junr., 1892, Rec. Geol. Surv., N.S.Wales, vol. iii., pt. 2, p. 54, pl. x., figs. 1-6; pl. xi., figs. 1-4.

*Observations.*—This fossil is not uncommon in the Silurian sandstones of Heathcote, Victoria. The examples are mostly in the condition of internal casts of the shell, but where the outer shell ornament is preserved the characteristic costation is seen.

Mr. Etheridge records this species from various localities in New South Wales, in strata of Silurian age, which he calls the "*Pentamerus* Limestones," and remarks on the fact of its being a characteristic fossil of the Aymestry Limestone in Wales and the West of England, occurring sparingly in the underlying Wenlock and the overlying Upper Ludlow.

<sup>1</sup> *Leptaena minima*, Sowerby, in Murchison's Silurian System, 1839, pl. xiii., figs. 4, 4a.

Its occurrence in Victoria is interesting, as it seems confined to the Melbournian stage of the Silurian rocks.

*Occurrence.*—Silurian (Melbournian). Heathcote. From the Geol. Surv. Coll. Bb 50 "Ranges E. of Heathcote," and Bb 51 "Mt. Ida, N. of Heathcote."

#### Genus *Clorinda*, Barrande.

*Clorinda linguifera*, Sow. sp., var. *wilkinsoni*, Eth. fil.

*Pentamerus linguifer*, J. de C. Sowerby, Etheridge, R., jnr., 1892, Records Geol. Surv., N. S. Wales, vol. iii., pt. 2, p. 52, pl. xi., figs. 5-9.

*Observations.*—Two specimens, rather crushed, but still showing the characters of the above variety, were collected by the early Geological Survey of Victoria from "sect. xii. Parish of Yering," a locality west of the present Yering railway station. The specimens were tableted and labelled "*Pentamerus*" by Sir F. McCoy.

The variety *wilkinsoni* differs from the specific form, according to Mr. Etheridge,<sup>1</sup> "in its peculiarly flattened ventral sulcus, and other minor characters. As before said, it seems to occupy an intermediate position between *P. linguifer* and *P. globosus*."

Both Victorian specimens are ventral valves, and, although deformed by pressure, the anterior margin is sufficiently distinct to show the broad ventral sulcus mentioned by Etheridge as a character of his N. S. Wales variety. This variety occurs in N. S. Wales in the Bowring Series (the Lower Limestones and the Lower Trilobite Bed), and in the Silurian of Hatton's Corner, Yass.

*Occurrence.*—Silurian (Yeringian). Geol. Surv. Coll. Sect. xii., Parish of Yering (W. of Yering railway station).

#### Genus *Gypidula*, J. Hall.

*Gypidula victoriae*, sp. nov. Plate XI., fig. 12.

*Description.*—Shell sub-pentagonal or broadly ovate. Ventral valve very tumid, with the beak strongly incurved; mesial fold broad, elevated, commencing about one-third from the beak and extending to the anterior margin, and medially sulcated. Brachial valve almost flat or gently convex in the median area, curving backwards towards the anterior margin; with a broad mesial sinus bearing a distinct median plait extending from the hinge to the anterior margin. Numerous concentric growth-lines on both valves.

<sup>1</sup> Loc. cit., p. 33.



Cardinal aspect of shell similar to Davidson's figure 21a, of *Gypidula* ("Pentamerus") *galeata*, Dalman sp.,<sup>1</sup> but more strongly, although simply, plicate.

*Measurements*.—Length of shell (beak to anterior), 19 mm.; width, 21.5 mm. Greatest depth of brachial valve, 5.25 mm.; ditto of ventral valve, 12 mm.

*Observations*.—The above species is represented by a perfectly preserved cast of the shell, which, as it still retains the minute characters of the growth-lines, must be regarded as superficially replacing part of the shell itself.

*Gypidula victoriae* is closely related to *G. galeata*, Dalman sp.,<sup>2</sup> a characteristic Silurian fossil having an extensive vertical range. The latter is found in the Wenlock and Ludlow in England; the Gotlandian in Scandinavia; the newer Silurian in Bohemia; lower Helderberg in the United States; the Devonian of the Ural Mountains; and in the Middle Devonian of the Eifel, Germany.

The chief differences between the Australian and the other widely distributed species are, the greater gibbosity of the umbo of the ventral valve; the comparative flatness of the brachial valve; and the vellicate or pinched-up character of the plications, with a correspondingly strong flexure of the sinus and fold of the median area. That this Australian species is clearly referable to *Gypidula*, J. Hall, and not to *Sieberella*, Oehlert, is shown by the discrete character of the septum in the brachial valve seen in the present specimen.

*Occurrence*.—Silurian (Yeringian). In mudstone, near Lilydale (Ruddock's Quarry). Collected and presented by W. J. Parr, Esq.

#### FAM. ATRYPIDAE.

#### Genus *Atrypa*, Dalman.

*Atrypa reticularis*, Linné sp., var. *decurrens*, var. nov.

Plate XI., fig. 13.

*Description*.—Shell sub-circular to long ovoid; ventral valve depressed, brachial valve tumid in the median area, but not so ridge-like as in typical examples of *A. imbricata*. Ornament consisting of radiating riblets crossed by conspicuous concentric lamellar folds.

<sup>1</sup> Mon. Sil. Brach. (Pal. Soc.), pt. vii., No. 2., 1867, pl. xv., fig. 21a

<sup>2</sup> *Atrypa galeata*, Dalman, Kongl. Vetensk. Acad. Handlingar, 1827, p. 130. *Pentamerus galeatus*, Dalman sp., Davidson, Mon. Sil. Brach. (Pal. Soc.), pt. vii., No. 2., 1867, p. 145, pl. xv. figs. 13-23.

*Observations.*—The Victorian specimens here ascribed to a new variety<sup>1</sup> are midway between *A. reticularis*, L. sp., and *A. imbricata*, Sow. sp.<sup>2</sup> Although possessing the strong imbricating lamellae of *A. imbricata*, the well-marked fold and sinus so characteristic of Sowerby's species is in most of the Victorian examples nearly absent. In a few specimens the latter feature is conspicuous and more pronounced than in the type form *A. reticularis*, in which the median area is broadly rounded and widely concave respectively. The relationship of the variety *decurrens* to *A. reticularis* is seen in the more acute and well-pronounced riblets and elongate form as compared with *A. imbricata*.

*Occurrence.*—Silurian (Yeringian). In mudstone; Loyola, near Mansfield. Collected and presented by G. Sweet, Esq., F.G.S. Also at Yering, Upper Yarra, Victoria. Geol. Surv. Coll.

*Atrypa aspera*, Schlotheim sp. Plate XI., Fig. 14.

*Terebratulula aspera*, Schlotheim, 1813, Leonhard's Taschenbuch, p. 74, pl. i., fig. 7; and Petrefactenkunde, 1820, pt. i., p. 263; pt. ii., 1822, p. 68, pl. xviii., fig. 3. *Atrypa aspera*, Schloth., sp., Dalman, 1827, Uppställning och Beskrifning af de i Sverige funne Terebratuliter; Kongl. Vetenskaps Academiens Handlingar för år 1827, p. 128, pl. iv., fig. 3. *Atrypa reticularis*, L. sp., var. *aspera*, Schloth., Davidson, 1865, Mon. Dev. Brach (Pal. Soc.), pt. ii., p. 57, pl. x., figs. 5-8.

*Observations.*—In common with other components of the rich Yeringian fauna of Victoria, this species is typical of the Devonian elsewhere, both in N. America and in England, and on the Continent. In N. America *A. aspera* var. *occidentalis*, Hall, occurs in the Middle Devonian (Hamilton Shales); whilst the typical species is found associated with *Atrypa reticularis* in the Middle Devonian Limestone of Devon and Cornwall. A curious lithological factor in regard to the distribution of this and the related form, *A. reticularis*, may here be noted, namely, the prevalence of *A. aspera* in the mudstones and of *A. reticularis* in the limestones, of the Yeringian stage; although both forms are occasionally found irrespectively of lithological conditions. This species has already been noted from both the Silurian and Devonian of Victoria by McCoy, who regarded it as a variety of *A. reticularis*.<sup>3</sup>

1 The name *decurrens* denotes a declension towards *A. imbricata*.

2 *Terebratulula imbricata*, Sowerby, 1839, in Murchison's Silurian System, pl. xiii., fig. 27. *Atrypa imbricata*, Sowerby sp., Davidson, Mon. Sil. Brach. (Pal. Soc.), pt. vii., No. 2, 1867, p. 135, pl. xv., figs. 3-8.

3 Prod. Pal. Victoria, dec. v., 1877, p. 26.

*Occurrence*.—Silurian (Yeringian). In mudstone at Loyola, near Mansfield; collected and presented by Mr. G. Sweet, F.G.S. *Atrypa aspera* also occurs in the Middle Devonian limestone of Bindi, Gippsland, Victoria, specimens of which, in the National Museum collection, were collected many years ago by Dr. A. W. Howitt.

*Atrypa fimbriata* sp. nov. Plate XI., Fig. 15.

*Description*.—Shell, suborbicular, inflated. Brachial valve highly convex in the median and cardinal regions, suddenly descending to a concave and outspread anterior margin, the edge of which is ornamented with numerous outspread and irregularly disposed spines. Surface of valve with 4 or 5 strong, sharp, concentric ridges, crossed by radial ribs, and forming nearly rectangular interspaces which are conspicuously excavated. The marginal spines, which are continuous with the radial ribs, are of variable length and variously directed, this latter feature probably owing to pressure. The type specimen is a well-preserved cast in which the shell seems to have been replaced by iron oxide.

*Measurements* (Holotype).—Length of shell to bases of spines, 16 mm.; width, 18 mm. Length of longest spine about 7 mm.

*Observations*.—This handsome species bears some relationship to two other forms of *Atrypa*, viz., *A. hystrix*, J. Hall,<sup>1</sup> and *A. spinosa*, J. Hall.<sup>2</sup> In *A. hystrix* the ribs are folded into tubular spines, mostly disposed round the margin of the shell, as in the present species; but the radials are not sharply defined, leaving concave areas in the interspaces between the concentrics and radials. On the other hand, in *A. spinosa* the shell is beset all over with spines, covering two-thirds of the total shell growth. Both *A. hystrix* and *A. spinosa* occur in much higher horizons than the present species; the former being found in the Chemung Group (Upper Devonian), the second in the Hamilton Group (Middle Devonian), of N. America.

*Occurrence*.—Silurian (Yeringian). In mudstone; near Lilydale. Specimen collected and presented by R. H. Annear, Esq.

#### FAM. SPIRIFERIDAE.

##### Genus *Cyrtina*, Davidson.

*Cyrtina sub-biplicata*, sp. nov. Plate XI., figs. 16a-c.

*Description*.—Shell small, sub-triangular. Pedicle valve with a high, triangular and arched cardinal area; remnants of the deltidial

<sup>1</sup> See Hall and Clarke, Pal. N. York, vol. viii., Brachiopoda, pt. ii., 1894, pl. lv., fig. 23.

<sup>2</sup> See *idem*, *ibid.*, pl. lv., figs. 21, 22.

plates or dental lamellae are seen attached to the sides of the cardinal area of the shell. A narrow slit-like depression, at the base of which the foramen was situated, is seen in the upper third of the deltidial area. Area on either side of the delthyrium transversely striate. Anterior margin of the pedicle valve irregularly flexuose. Cardinal extremities of valve blunt. Shell smooth, excepting for a few concentric, lamellar folds and the sharply plicate margins of the sinus, the latter being deeply sulcate.

*Measurements*.—Holotype: Length, 6 mm.; width, 9.75 mm.; length of hinge area, 3.5 mm.

*Observations*.—The nearest related form to the above is James Hall's *C. biplicata*,<sup>1</sup> a Lower Devonian species, which occurs in the Corniferous Limestone (Upper Helderberg) of Michigan, and in the Schoharie Grit of Schoharie, N. York (base of Upper Helderberg Group).

The present species differs in its blunt cardinal extremities and more deeply sunken sinus of the pedicle valve.

*Occurrence*.—Silurian (Yeringian). In brown mudstone at Rud-dock's Quarry, near Lilydale. Collected and presented by J. S. Green, Esq.

#### Genus *Spirifer*, Sowerby.

*Spirifer lilydalensis*, sp. nov. Plate XI, figs. 17, 18.

*Description*.—Shell referable to the *S. sub-orbicularis* type; that is, "with sub-orbicular outline, broad, low and usually lateral plications; the median plications are few and indistinct."<sup>2</sup> Shell almost equally convex, with rounded to salient cardinal extremities. The pedicle valve is strongly curved towards the prominent beak; mesial sinus deeply excavate and feebly plicated, especially near the anterior margin, the margins of the sinus more or less ridge-like. The brachial valve bears a broad mesial fold, which is conspicuously, longitudinally striated. The general shell-surface is finely striated by delicate radial lines, and the shell is irregularly set off concentrically by a few lamellar growth-lines. Radial ribs rounded and gently curved; they number from 8 to 10 on each side of the fold and sinus.

*Measurements*.—A brachial valve (cotype): Length (anterior margin to beak), 19.5 mm.; width, 30.5 mm. A ventral valve (cotype): Length, 14 mm.; width, 22 mm.

1 See Hall and Clark, Pal. N. York, vol. viii., Pal. Brach., pt. ii., 1894, pl. xxviii., figs. 7-9.

2 Hall and Clarke, Pal. N. York, vol. viii., Pal. Brach., pt. ii., 1894, p. 26.

*Observations.*—This spirifer has marked characters of its own which make it easily separable from the other Victorian Silurian spirifers, namely, *S. plicatellus*, L. sp., var. *macropleura*, Conrad; *S. sulcatus*, Hisinger, sp.; and *S. perlamellosus*, J. Hall, var. *densilineata*, Chapm. The nearest related form to the present species is *S. concinnus*, J. Hall,<sup>1</sup> a spirifer of the sub-orbicularis type from the Lower Helderbergian of N. America. From *S. concinnus* the Lilydale species is separated by the smaller number of ribs, which vary from 8 to 10, against 12 to 14 in the Lower Helderberg form.

The Bohemian Silurian species, *Spirifer viator*, Barrande,<sup>2</sup> approaches our form in the young stage, but in the ephebic and gerontic conditions it has a remarkably large and salient mesial fold. Moreover there are fewer ribs in that species; that is, 6 to 7 on each side of the mesial fold and sinus.

Another somewhat related species is McCoy's *Spirifer bijugosus*, which occurs in the Wenlock Shale of Ireland.<sup>3</sup> So close is its resemblance to the Victorian fossils in many points that the writer had previously tentatively referred the latter to McCoy's species. In the number of the ribs the Irish species more nearly agrees with ours, being 10 to 12 on each side as compared with the Victorian with 8 to 10. The deep dividing groove of the mesial fold in *S. bijugosus* is sufficient distinction, however, to specifically separate our Victorian specimens. At the same time it is extremely interesting to note the double relationship of the two widely separated brachiopod faunas of the British Wenlockian Series and the Lower Helderbergian of N. America, with the Victorian Yeringian strata.

At a casual glance, Mr. W. S. Dun's Devonian species *S. pittmani*,<sup>4</sup> from N. S. Wales, might easily be mistaken for *S. lilydalensis*. The two forms belong, however, to separate groups. The ostiolate group to which *S. pittmani* and *S. yassensis* must be referred, have a smooth sinus and fold; while *S. lilydalensis* and the other related forms of the sub-orbiculate group have the median area striated or plicated.

*Occurrence.*—Well-preserved casts and moulds are often found in the brown mudstone of the Lilydale district. The cotype of the brachial valve was collected and presented by R. H. Annear, Esq..

1 Pal. N. York, vol. iii., 1859, p. 200, pl. xxv., figs. 2*a-i*, and pl. xxviii., fig. 7. See also Hall and Clarke, *ibid.*, vol. viii., pt. ii., 1894, pl. xxx., figs. 1, 2.

2 Système Silurien du centre de la Bohême, vol. v., 1879, pl. vii., figs. 4-11; pl. lxxiii., figs. iii., 1-8; pl. xxiv., fig. vi.

3 Synopsis Silurian Fossils Ireland, 1846, p. 36, pl. iii., fig. 23. See also Davidson, *Brit. Sil. Brach.* (Pal. Soc.), pt. vii., No. 1, 1866, pl. x., figs. 1-5, and pt. vii., No. 2, 1867, p. 89.

4 Dun, W. S. *Rec. Geol. Surv. N. S. Wales*, vol. vi., pt. 4, 1904, p. 320, pl. lxi., figs. 4, 4*a*, 4*b*

who obtained it from Wilson's Quarry, near Lilydale. An extensive series of the same fossil was collected and presented by the Rev. A. W. Cresswell, M.A., who obtained these spirifers from various exposures to the north of Lilydale. Silurian (Yeringian).

## EXPLANATION OF PLATES.

## PLATE X.

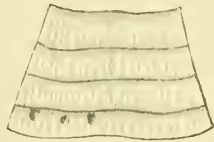
- Fig. 1.—*Siphonotreta plicatella*, sp. nov.: *a*, pedicle valve (holotype),  $\times 6$ ; *b*, profile of valve,  $\times 6$ ; *c*, ornament of anterior part of valve,  $\times 18$ . Silurian (Melbournian): Yan Yean, Victoria. Coll. Mr. A. J. Shearsby, F.R.M.S.
- Fig. 2.—*Crania pulchelloides*, sp. nov. *a*, apical aspect; *b*, profile. Silurian (Yeringian): Ruddock's Quarry, near Lilydale, Victoria. Coll. by Mr. W. J. Parr.  $\times 4$ .
- Fig. 3.—*Leptaena rhomboidalis*, Wilckens sp. Cardinal area and posterior portion of shell, to show denticulated hinge-line. Silurian (Yeringian): Loyola, near Mansfield, Victoria. Coll. by Mr. G. Sweet, F.G.S.  $\times 2$ .
- Fig. 4.—*L. rhomboidalis*, Wilckens sp. Interior of a brachial or dorsal valve in the neanic stage, showing impression of the fleshy spiralia and crura. Silurian (Yeringian): Loyola, near Mansfield, Victoria. Coll. by Mr. G. Sweet, F.G.S.  $\times 3$ .
- Fig. 5.—*L. rhomboidalis*, Wilckens sp. Wax squeeze from interior of brachial valve (Fig. 4), showing form of spiralia.  $\times 3$ .
- Fig. 6.—*L. rhomboidalis*, Wilckens sp. Natural cast in mudstone of interior of brachial valve. Silurian (Yeringian): Loyola, near Mansfield. Coll. by Mr. G. Sweet, F.G.S.  $\times 3$ .
- Fig. 7.—*L. rhomboidalis*, Wilckens sp. Wax squeeze from natural impression of brachial valve (Fig. 6), showing brachial impressions.  $\times 3$ .
- Fig. 8.—*Chonetes bipartita*, sp. nov. Pedicle valve (cotype). Silurian (Yeringian): Ruddock's Quarry, near Lilydale. Coll. by Mr. J. S. Green.  $\times 3$ .
- Fig. 9.—*C. bipartita*, sp. nov. Pedicle valve of a larger example (paratype). Silurian (Yeringian): Simmonds' Bridge Hut on the Yarra. Coll. Geol. Surv. Vict.  $\times 3$ .

1a



$\frac{6}{1}$

1c



$\frac{19}{1}$

2a



$\frac{4}{1}$

1b



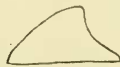
$\frac{6}{1}$

3



$\frac{2}{1}$

2b



$\frac{4}{1}$

5



$\frac{3}{1}$

4



$\frac{3}{1}$

9



$\frac{3}{1}$

8



$\frac{3}{1}$

6



$\frac{3}{1}$

7



$\frac{3}{1}$

10



$\frac{3}{1}$